UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

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FROM: James Wolf
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DATE: November 20, 2001

RE: Disulfoton residues in ground water found in the Virginia BMP Study:

BMP Impacts on Nitrate and Pesticide Transport to Groundwater in the Nomini Creek Watershed. Final Report Report No. NC-0298

S. Mostaghimi, S. Shukla, and P. W. McClellan. 1998.
Biological Systems Engineering Department
Virginia Polytechnic Institute and State University
Blacksburg, VA

- The ground water monitoring component was started in 1986 and ended in June, 1997.

- Nomini Creek Watershed is located in Westmoreland County, Va. The 1463 ha watershed has typical Coastal Plain land use 49% cropland, 47% woodland, and 4% used for homestead and roads (different reports has slightly different breakdown, but have the same major uses). Average annual precipitation is 102 cm, with most of the rainfall occurring between April and September. Most ground water recharge occurs in late Fall or early spring.

- Nomini Creek Watershed is located in the Coastal Plain Physiographic providence. Soils, geology and topography are similar to the of the unglaciated Atlantic Coastal Plain.

Soils are mostly Ultisols. The major soil series are Suffolk and Rumford. These soils cover 91 percent of the area and have similar physical properties.

Soil	Taxonomy
Sulfolk	Coarse-loamy, siliceous, thermic Typic Hapudults
Rumford	Coarse-loamy, siliceous, thermic Typic Hapudults

The Coastal Plain has been identified as a vulnerable area to ground water contamination. Other vulnerable regions have also been identified. The soils could also be used to identify possible problem areas. (Can't be done by tomorrow). These are vulnerable soil for leaching.

- Agriculture is primarily row crops. Major crops are corn, soybeans, and small grains (wheat and barley). Typical rotation is conventionally-tilled corn, followed by small grains with no-till soybeans planted in the small grain residues. Occasionally, full season, conventionally-tilled soybeans is also grown. USDA Ag Statistics do not report tobacco production for Westmoreland County. Potatoes are reported to be produced, but production appears to be declining.

- Study Objective to study the quality of surface and ground water as influenced by the agricultural practices in the watershed.

- Monitoring consisted of two (2) runoff and surface water monitoring stations; seven rain gauges; one weather station; and eight (8) ground-water monitoring wells (GN1 to GN8). The ground water wells were located primarily in agricultural areas. These wells were drilled in pairs, 100 - 150 meters apart, with one in pair located hydraulically down-gradient of the other.

Characteristic (m)	Value	Well							
		GN1	GN2	GN3	GN4	GN5	GN6	GN7	GN8
Well depth		13.7	12.8	15.2	13.7	16.5	12.0	15.8	11.9
GW depth	Mean	10.3	9.6	13.1	9.4	12.9	8.2	13.3	8.6
"	Max.	12.0	10.8	14.0	12.7	13.9	9.1	14.4	9.6
"	Min	8.5	7.1	11.5	7.0	11.3	7.0	11.8	7.4

- Approximately monthly samples were taken from each monitoring well and analyzed for a number of analytes including 22 pesticides. QA/QC procedures were followed.

- Herbicide and insecticide application information in the watershed were obtained from farmer surveys. The rate and time of herbicide application was dependent on the crop rotation adopted by the farmer. Corn is usually planted between late April and early May. Post-emergence sprays applications occur in early July. The timing and application rates of insecticides, applied individually or in combination, in the watershed depending on the type and extent of the insect problem observed.

Note: the label does allow for fall application to wheat. Perhaps fall application and greater fall recharge resulted in the observed concentration (2.87 µg/L). Possible mitigation option?

- Disulfoton sampling results and detection statistics in the Nomini Creek Watershed (Table 15, after Mostaghimi, 1998). These are disulfoton parent.

Pesticide	Total Samples	Detections[1]	Detection[2] Frequency (percent)	Concentration (µg/L)		
				Max	Mean	SD
Disulfoton	1010	10	1.0	2.87	0.39	0.32
	Pre-BMP[3] (5/86 - 10/88)					
	229	7	3.1	2.87	0.52	-
	Post-BMP[4] (11/89 - 9/96)					
	693	3	0.4	0.10	0.08	-

[1] Number of samples with detectable levels of pesticide
[2] (samples with detectable levels of pesticide * 100)/total number of samples
[3] Before agricultural Best Management Practice (BMP) implemented in watershed.
[4] Following the implementation of BMP within the watershed.

Note: I only had (raw) data through 1990. Thus, I only had 6 of the 10 detections, mean was 0.57 µg/L, which is only slightly greater than the mean with 7 samples (pre-BMP).

Disscussion and recommendation:

The following table was included in Feb. 7, 2000 Additional Clarification of Disulfoton Ground-Water Monitoring Data Assessment. In a recent discussion about a "chronic" exposure for ground water the following suggestions was put forth (mean = 1.49 µg/L = (2.87 +0.1)/2 for well site GN3. Considering there are many "monthly samples, with most being less than the detection limit, a lower mean is probably justified (disulfoton parent only). The mean of all the detections is 0.39 µg/L, the mean of the pre-BMP is 0.52 µg/L, and post-BMP is 0.08 µg/L. Without specifically estimating a concentration, I think that as far as parent disulfoton goes, the average concentration would be expected to be considerably less than the DWLOC of 1.2(?).

Summary of Disulfoton Detections in ground water from the eight ground-water monitoring wells in Nomini Creek Watershed (Virginia), during 1986 and 1987.

Sampling Date	**Well-Site Number**	**Concentration (µg/L)**
11/5/86	GN3	2.87
11/5/86	GN6	0.04
3/13/87	GN4	0.10
8/20/87	GN1	0.13
8/20/87	GN2	0.16
8/20/87	GN3	0.10